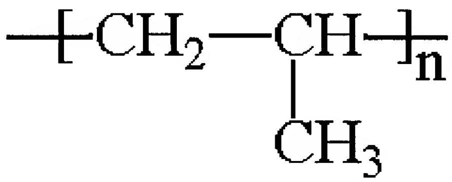
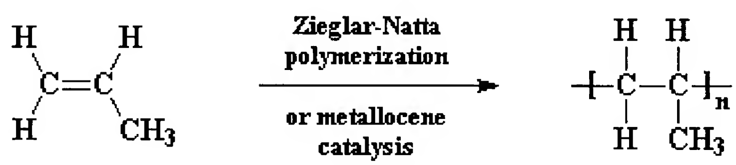
Polypropylene



For polypropylene at a glance, click here!

Polypropylene is one of those rather versatile polymers out there. It serves double duty, both as a plastic and a fiber. As a plastic it is used to make things like dishwasher-safe food containers. It can do this because it doesn't melt below 160 ^{o}C, or 320 ^{o}F. Polyethylene, a more common plastic, will anneal at around 100 ^{o}C, wl means that polyethylene dishes will warp in the dishwasher. As a fiber, polypropylene is used to make indoor outdoor carpeting, the kind that you always find around swimming pools and miniature golf courses. It worl well for outdoor carpet because it is easy to make colored polypropylene, and because polypropylene doesn't absorb water, like nylon does.

Structurally, it is a vinyl polymer, and is similar to polyethylene, only that on every other carbon atom in the backbone chain has a methyl group attached to it. Polypropylene can be made from the monomer propylene Ziegler-Natta polymerization and by metallocene catalysis polymerization.

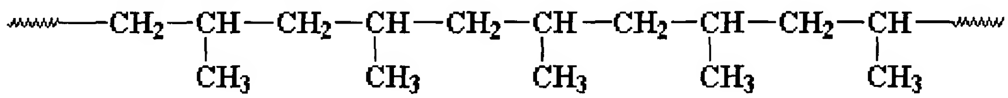


propylene polypropylene

This is what the monomer propylene really looks like:

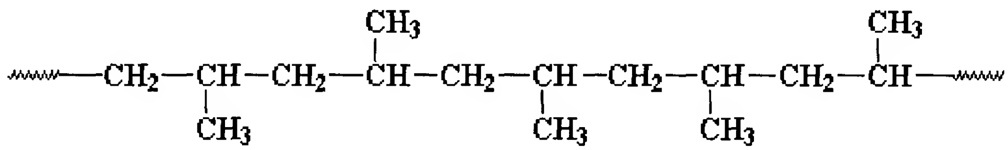
Wanna know more?

Research is being conducted on using metallocene catalysis polymerization to synthesize polypropylene. Metallocene catalysis polymerization can do some pretty amazing things for polypropylene. Polypropylene c be made with different tacticities. Most polypropylene we use is *isotactic*. This means that all the methyl grou are on the same side of the chain, like this:



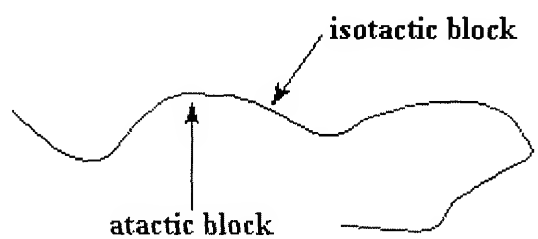
isotactic polypropylene

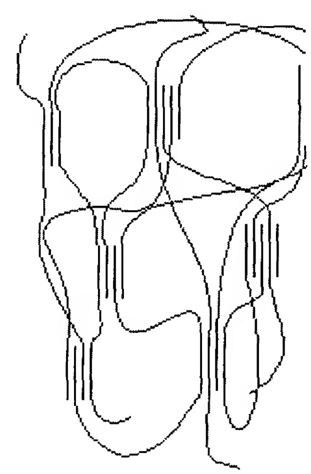
But sometimes we use *atactic* polypropylene. *Atactic* means that the methyl groups are placed randomly on b sides of the chain like this:



atactic polypropylene

However, using special metallocene catalysts it is believed that we can make polymers which contain blocks o isotactic polypropylene and blocks of atactic polypropylene in the same polymer chain, as is shown in the picture:





This polymer is rubbery, and makes a good elastomer. This is because the isotactic blocks will form crystals by themselves. But because the isotactic blocks are joined to the atactic blocks, each little hard clump of crystalline isotactic polypropylene will be tied together by soft rubbery tethers of atactic polypropylene, as you can see in the picture on the right.

To be honest, atactic polypropylene would be rubbery without help from the isotactic blocks, but it wouldn't be very strong. The hard isotactic blocks hold the rubbery isotactic material together, to give the material more strength. Most kinds of rubber have to be crosslinked to give them strength, but not polypropylene elastomers.

Elastomeric polypropylene, as this copolymer is called, is a kind of thermoplastic elastomer. However, until the research is completed, this type of polypropylene will not be commercially available.

The polypropylene which you can buy off the shelf at the store today has about 50 - 60% crystallinity, but this too much for it to behave as an elastomer.

Other polymers used as plastics include:	Other polymers used as fibers include:
Polyethylene	Polyethylene
Polyesters	Polyesters
Polystyrene	Nylon
Polycarbonate	Kevlar and Nomex

PVC	Polyacrylonitrile
Nylon	Cellulose
Poly(methyl methacrylate)	Polyurethanes

Return to Level Two Directory

Return to Macrogalleria Directory
